Does Financial Information Presentation Format Matter? Evidence from Research and Development Expense Reporting

Partha Mohanram
Rotman School of Management
University of Toronto
partha.mohanram@rotman.utoronto.ca

Wei Sun
School of Business
Univ. of International Business & Economics
sunwei@uibe.edu.cn

Baohua Xin
Rotman School of Management
University of Toronto
baohua.xin@rotman.utoronto.ca

Jigao Zhu
School of Business
Univ. of International Business & Economics
zhujigao@uibe.edu.cn

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ABSTRACT

This paper investigates the real and capital market effects of a mandatory change in the presentation format of research and development (R&D) expenses. We utilize a natural experiment of China's implementation of a new presentation format of corporate R&D expense that requires Chinese public firms to present their R&D expense on their income statements as a separate line item (income statement presentation), instead of as part of the general and administrative expenses supplemented by additional information in the notes to the financial statements (footnote presentation). We predict and find that firms report higher R&D expense in the income statement presentation regime. We further find that firms' innovation efficiency decreases, and the positive valuation implication of reported R&D expense diminishes after the presentation format change. The evidence is consistent with firms' increasing their reported R&D expense by (re)classifying some general and administrative expenses to R&D expense. These findings suggest that the R&D expense presentation format regulation, which aims to improve R&D information transparency, may have unintended consequences.

1. Introduction

Research and development (R&D) activities are a crucial source of firms' competitive advantage. R&D expenditures are a primary measure of corporate innovation (Lerner and Wulf 2007) that provide potential long-term benefits to firms (Kothari et al. 2002) and are positively valued by investors (e.g., Lev and Sougiannis 1996; Chan et al. 2001; Eberhart et al. 2004). Thus, financial reporting of corporate R&D investment can potentially have important real and capital market implications. However, R&D activities are inherently risky, subject to high levels of uncertainty and are difficult to assess and measure. This results in R&D reporting being subject to both intrinsic measurement issues and extrinsic managerial discretion.[1]

In this study, we investigate how a mandatory change in the presentation format of firms' R&D expense affects managerial R&D reporting and investing behavior, and whether investors adjust their valuation of the reported R&D expense in response to the potential changes in managerial behavior induced by this format change. We investigate these research questions by employing a natural experiment of China's implementation of a new presentation format of R&D expense in the financial reports of the companies listed in the two Chinese stock exchanges, namely, the Shanghai Stock Exchange (SSE) and the Shenzhen Stock Exchange (SZSE).

Staring from 2018, public companies in China are required to present their R&D expense on their income statements as a separate line item (income statement presentation),

[1] Kanodia et al. (2004) demonstrate analytically that the inherent fuzziness in the boundaries between operating expenditures and R&D investments, which requires much subjective judgment by accountants and auditors to separate the two, can lead to inefficiencies in firm operations when R&D investments are measured and reported separately from other operating expenditures. There is also ample empirical evidence that managers strategically report firms' R&D expense to serve their own purposes (see for example, Lev et al. 2005, Koh and Reeb 2015, Fedyk et al. 2017, and Sun 2021).

instead of commingling them with other general and administrative expenses and providing a detailed breakdown that identifies R&D expense in the notes to the financial statements (footnote presentation). This is in contrast to both the Generally Accepted Accounting Principles in the U.S. (U.S. GAAP) and the International Financial Reporting Standards (IFRS), neither of which mandate firms to report R&D expense on the income statements separately. This new regulation hence provides a unique setting to examine the effect of the presentation format of R&D expense on both managerial R&D reporting as well as the investor response to the reported R&D expense.

Accounting earnings and its components are crucial inputs in the valuation of firms. Prior research has shown that information is better used when it is readily available and processable (Russo 1977), and the cost of acquiring and processing information adversely affects its incorporation in decisions making (Grossman and Stiglitz 1980). Assuming investors are boundedly rational and have limited attention, information reported explicitly on financial statements is more accessible and potentially more heavily weighted by investors in their valuation of firms than information disclosed in footnotes (Hand 1990, Hirshleifer and Teoh 2003). The regulatory change in China makes firms' R&D expense information more accessible to investors. Since R&D expenditures have positive valuation implications (Lev and Sougiannis 1996, Kothari et al. 2002, Sun 2021), we expect that this regulatory change provides managers incentives to report higher R&D expense, or increase their investment in R&D, or both, in the post-regulation period, to boost firms' stock performance, all else being held constant. We also expect that rational investors, in anticipation of such potential changes in managerial R&D reporting and investing behavior, would adjust their valuations of firms'

reported R&D expense as firms switch from footnote presentation to income statement presentation of their R&D expense.

Using a sample of nonfinancial public firms with non-zero reported R&D expense in years of 2015 through 2020 (three years pre-regulation in 2015–2017 and three years post-regulation in 2018–2020), we first document that firms' reported R&D expense increase after mandatory income statement presentation. We then examine if the effect of the change in the presentation format of R&D expense on managers' R&D reporting and/or investing varies systematically in the cross-section. We find that the increase in reported R&D expense post-regulation are concentrated on non-state-owned enterprises (non-SOEs) while SOEs do not seem to increase their reported R&D expense. This result is consistent with the observation that SOEs generally do not include stock market performance in their managerial evaluation system (Du et al. 2012) and thus managers of SOEs do not have strong incentive to report higher R&D expense to cater to the stock market. We also find that firms facing higher peer pressure increase their reported R&D expense to a larger extent post-regulation, consistent with the theoretical prediction that peer firms' reporting decisions are correlated, i.e., managers' incentive to manipulate financial reports increases in their expectation of their peers' incentive to manipulate (Gao and Zhang 2018).

The result that firms increase their reported R&D expense is consistent with the conjecture that after the new mandate takes effect, managers strategically adjust their reporting of R&D expense by (mis)classifying some ordinary general and administrative expenses to R&D expense. However, it is also consistent with firms' increasing their R&D investments in response to the presentation format change. To differentiate these two potential channels, we

examine changes in firms' innovation efficiency before and after the change of the presentation format of R&D expense. We find that firms' innovation efficiency significantly decreases post-regulation, suggesting that firms do not increase their R&D investments to the levels that parallel their reported R&D expense. Thus, we infer that at least part of the increases in reported R&D expense in the income statement presentation regime is attributable to managers' overreporting of R&D expense post-regulation.[3]

We extract firms' reported R&D expense of 2017 from their 2018 comparative income statements and compare them to the R&D expense originally reported in the notes to the 2017 income statements. We find that firms under higher peer pressure adjust their reported R&D expense upward to a larger extent, which provides direct evidence that (some) firms inflated their reported R&D expense in the income statement presentation regime, by (re)classifying into R&D some general and administrative expenses that were not included in R&D in the original financial reports.

Our final set of tests examine the investor reaction to the change in the reporting for R&D. We document that the positive implication of reported R&D expense for firm valuation is reduced in the income statement presentation regime, consistent with rational investors accounting for managers' opportunistic R&D reporting by discounting the "valuation multiple" for reported R&D expense. Thus, the mandatory change in the presentation format of R&D expense leads managers and investors into a new equilibrium in which managers over-report

[3] We cannot rule out the possibility that firms may also have increased their R&D investment in response to the mandated format change by undertaking inefficient R&D projects (i.e., overinvestment in R&D) – if true, this is an unintended "real" consequence of the increased transparency in R&D reporting as intended by the new regulation. If firms indeed increase investment in R&D, we expect to observe an increase in the capitalized R&D amounts post-regulation. This is not shown in our data.

firms' R&D expense to boost stock prices while investors are not fooled in the sense that they rationally discount the reported R&D expense in their valuation of firms (see Stein 1989).

Our study contributes to the accounting literature in the following aspects. First, we add to the literature on the capital market and real effects of financial information presentation format, because the unique setting of our paper offers us the opportunity to gain insights on issues that prior research does not address. Maines and McDaniel (2000), Lee et al. (2006), and Chambers et al. (2007) study differential investor reaction to the same piece of financial information when it is presented on one financial statement versus another when managers can *choose* between the two financial statements. Bartov and Mohanram (2014) and Luo et al. (2018) examine a related issue in settings where the relevant accounting item is *mandated* to change its presentation location *within* the same financial statement. We also study a mandatory change of presentation location of an accounting item, but in our setting, the financial information is elevated from notes accompanying the financial statements to the income statement. Our setting is fundamentally different from the recognition versus disclosure literature (e.g., Espahbodi et al. 2002, Ahmed et al. 2006, Michels 2017, Basu and Naughton 2020) where the information contained in the footnotes is disclosed but not recognized, while the information contained in the main body of the financial statements is recognized.[4] In our setting, the accounting item in question is always recognized, regardless whether it is placed in the footnotes or in the financial statements. In this sense, Riedl and Srinivasan's (2010) special items have the same feature as our R&D expense, i.e. they are recognized both when they are

[4] This literature examining accounting standards regarding stock options, post-retirement benefits, subsequent events (e.g., Espahbodi et al., 2002, Choudhary 2011, Michels 2017, Basu and Naughton 2020) argues that the information content of the same piece of accounting information can be very different depending on whether it is disclosed or recognized due to stricter scrutiny by corporate management, auditors, and regulators (Frederickson et al. 2006, Clor-Proell and Maines 2014).

aggregated with other items on the income statement with footnote disclosure as well as when they are reported as a separate line item on the income statement. However, in Riedl and Srinivasan (2010), it is firms' *voluntary* decision on which presentation format to use, while our setting represents a mandatory change. Moreover, we also shed light on the real effects of the R&D expense presentation format change (i.e., innovation efficiency).

Second, we contribute to the earnings management literature by providing direct evidence on classification shifting. McVay (2006) documents that firms manage their (core) earnings through (mis)classifying core expenses to special items. Subsequent studies (Fan et al. 2010, Haw et al. 2011) provide further evidence consistent with earnings management via classification shifting. In particular, Fan and Liu (2017) finds that managers tend to misclassify costs of goods sold (COGS) rather than selling, general, and administrative expenses (SG&A) to special items when firms are close to missing gross margins benchmarks, but misclassify both COGS and SG&A when the targets are core earnings. In these studies, classification shifting takes place between core expenses and income-decreasing special items. We provide evidence that expense (mis)classification also occurs within the same broad category of core expenses, that is, classification between non-R&D expense and R&D expense within general and administrative expenses. Moreover, rather than inferring the existence of classification shifting *indirectly* from regressions as in prior studies, we directly test whether firms engage in classification shifting between R&D and non-R&D expense by comparing expenses disclosed but not reported pre-regulation (2017) with the same numbers reported in the post-regulation financial statements.

Lastly, our findings have implications for financial information aggregation/disaggregation. Riedl and Srinivasan (2010) find that managers use their discretion in the presentation of special items to assist users to better understand the economic implications of these special items. Enache and Srivastava (2018) argue that disaggregation of R&D expense, non-R&D intangible expenditures, and other operating expenses in SG&A improves earnings and return predictability. Our results, however, suggest that managers may opportunistically classify expenses in SG&A to different sub-categories to influence investor perception of firm performance. Thus, disaggregation, at least in the setting we study, could have unintended consequences.

The remainder of this paper is organized as follows. Section 2 discusses the institutional background and develops the hypotheses. Section 3 describes the data and research design. We report the main results in Section 4 and supplementary analyses in Section 5. Section 6 concludes.

2. Background and Hypotheses Development

R&D Expense Presentation Rules

In China, the accounting standards and the format of financial statement are set by the Ministry of Finance of the People's Republic of China (the MOF hereafter). Before 2018, firms reported their R&D expense as part of their general and administrative expenses in the income statements. Supplementary reporting in the footnotes provided the disaggregation of the major components of the general and administrative expenses including R&D expense. In June 2018, in an attempt to increase financial reporting transparency, the MOF issued a new reporting

regulation that mandates public companies to present their R&D expense on their income statements as a separate line item.[5]

This mandate presents a significant departure from both the Generally Accepted Accounting Principles in the U.S. (U.S. GAAP) and the International Financial Reporting Standards (IFRS) as neither mandates firms to report R&D expense on the income statements separately, but provides firms the discretion to report R&D expense separately in the income statements or lump them with other expense items (see Accounting Standards Codification or ASC 730 and International Accounting Standards or IAS 38). Hence, it is a voluntary choice by firms to report R&D expense as a separate line item on their income statements. Another difference between U.S. GAAP and the Chinese Accounting Standards (CAS) regarding the treatment of R&D expenditures is that U.S. GAAP requires immediate expensing of all R&D expenditures (with exceptions for the software industry), while CAS allows capitalization of R&D outlays under certain circumstances – similar to IFRS.[6] We employ this unique natural experiment to examine the real and market consequences of a change in the presentation format of a major accounting item that has significant valuation implications (i.e., R&D expense).

Hypotheses Development

Accounting numbers, especially earnings and its components, are crucial inputs in firm valuation. The prior literature has documented that managers have strong incentives to manage their bottom-line earnings or core earnings to influence the capital market's perception of firms'

[5] The MOF requires all public companies to strictly follow a fixed financial statement format with very limited flexibility, with the exception that firms in the financial industry follow a different format with some added flexibility.

[6] According to our sample statistics, Chinese public companies capitalize on average only 10.2% of R&D outlays. Therefore, we focus on reported R&D expense in our analysis, while controlling for capitalized R&D amounts when necessary.

prospects (e.g., Graham et al. 2005), and they have a wide range of tools to help them to achieve their goals including accruals-based earnings management, real earnings management and classification shifting (e.g., McVay 2006, Roychowdhury 2006, Cohen et al. 2008).

R&D activities are an important source of firm innovation (Lerner and Wulf 2007) and provide potential long-term benefits to firms (Kothari et al. 2002). Unlike (most) other general and administrative expenses, of which R&D expense are lumped with on firms' income statements, R&D expense are viewed by investors not as period expenses but rather as assets that generate future value (Lev and Sougiannis 1996, Guo et al. 2005, Andre et al. 2007, Joos and Zhdanov 2008). The differential valuation implications of R&D expense and other general and administrative expenses (Enache and Srivastava 2018) provide firms incentives to separate R&D expense from other general and administrative expenses and to (mis)classify some expenses in the latter category to R&D expense. Fedyk et al. (2017) and Sun (2021) find empirical evidence that is consistent with firms' reporting unusually high (discretionary) R&D expense during their initial public offering and seasoned equity offering periods, respectively.

Furthermore, measurement of R&D expenditures is subject to significant measurement issues, for example, the inherent fuzziness in the boundaries of R&D and other general and administrative expenses (Kanodia et al. 2004). Current accounting guidelines for categorizing R&D expense also offers managers substantial discretion in R&D reporting (Koh and Reeb 2015). For example, if R&D activities are conducted in the operational units, managers have considerable latitude in allocating incurred costs such as personnel and overhead between R&D expense and operational/general expenses. Evidence consistent with such strategic reporting of R&D expense is documented in Koh and Reeb (2015), Chen et al. (2021) and Sun (2021).

We examine whether the change in the presentation format of R&D expense mandated by MOF influences managers' R&D reporting and investing incentives. In a fully efficient capital market where investors incorporate all the available information completely in the stock prices, this change in the presentation format should have no impact on firms' R&D reporting/investing behavior or the investors' response, because the information content of the reported R&D expense is identical regardless of the location in which it is presented. However, investors have limited attention (Hirshleifer and Teoh 2003), and searching for every piece of information pertinent to security valuation is difficult and costly (Barth et al. 2003). Prior research has shown that information is more efficiently utilized when it is readily available and processable (Russo 1977), and the cost of acquiring and processing information adversely affects its incorporation in decision making (Grossman and Stiglitz 1980). Thus, we expect that this regulatory change could affect managers' R&D reporting and investing decisions via its impact on investor valuation of firms' reported R&D expense.

Extant accounting research has provided evidence that the location of information does affect investors' information acquisition and processing costs, which in turn affects how investors price the information (Hirst and Hopkins 1998, Maines and McDaniel 2000, Chambers et al. 2007, Bartov and Mohanram 2014, Luo et al. 2018). In the settings of these papers, the location of the information is either between two major financial statements (e.g., comprehensive income on the statement of performance versus balance sheet/statement of equity), or within the same financial statement (gains or losses from early debt retirement or investment on income statement). In our setting, prior to the MOF's mandate, R&D expense was reported separately in the notes accompanying the financial statements, which would

potentially impose costs on the investors to acquire and process this information. The new mandate of income statement presentation of R&D expense makes R&D expense information more accessible and easier to process, which potentially makes it more likely that investors would incorporate it into their valuation of firms, which in turn would lead to higher valuation. Additionally, financial statement users may perceive the mandated change in the presentation format of R&D expense as the regulator's intent to highlight increased valuation relevance of R&D. Consequently, investors may increase the weight on firms' reported R&D expense in their valuation of firms in the income statement presentation regime.

In summary, the potential adjustment in investor valuation of the reported R&D expense as a result of the MOF's mandatory change in the presentation format of R&D expense provides managers incentives to report higher R&D expense to boost stock prices. This leads to our first hypothesis, presented in the alternate form:

H1: Firms report higher R&D expense in the income statement presentation regime than in the footnote presentation regime.

We develop two cross-sectional predictions with regard to increased R&D expense report in the income statement presentation regime. First, we examine whether ownership structure plays a role in influencing how managers respond to the regulation. In China, the evaluation of executives of state owned enterprises or SOEs are conducted by the State-Owned Assets Supervision and Administration Commission of China (SASAC) and prior research (Du et al. 2012) has shown that the evaluation system does not involve stock market performance. Furthermore, SOEs usually have easier access to bank loans and have lower need to raise funds from the capital market. Therefore, we expect that SOEs have less incentives to cater to the

stock market and thus do not increase their reported R&D expense in response to the presentation format change as much as non-SOEs.

H1a: The increase in reported R&D expense in the income statement presentation regime is more pronounced for non-SOEs.

Second, we examine the effect of peer pressure. The action chosen by one firm can affect the preferences of its economically related peers and, in turn, its peers' actions (Manski 2000). Peer pressure can stem from managers' incentive to compete for capital, mimic peers, or satisfy the demand of common institutional investors (Merton 1957; Bryant 1983; Diamond 1985; Jung 2013). Extant empirical studies provide evidence that industry peers have interdependent corporate policies, such as capital structure (Leary and Roberts 2014) and investment (Beatty et al. 2013). Clor-Proell and Maines (2014) argue that managers' discretionary reporting behaviors are shaped by forces exerted by other participants in the capital markets. Gao and Zhang (2018) show analytically that peer firms' manipulation decisions are correlated, i.e., a firm's incentive to report strategically increases in the expectation that peer firms are also reporting strategically. Bagnoli and Watts (2010) document that firms are pressured to manage earnings if their competitors engage in earnings management. Since firms' R&D activities are usually benchmarked against R&D activities of their industry peers, we expect that firms facing higher peer pressure increase their reported R&D expense more in the post-regulation period.

H1b: The increase in reported R&D expense in the income statement presentation regime is more pronounced for firms facing higher peer pressure.

A natural follow-up question is what drives the increase in firms' reported R&D expense post-regulation? There are three possibilities – firms may respond to the regulatory change by increasing their investment in R&D activities, or they may simply report higher R&D expense by (re)classifying other general and administrative expenses as R&D expense without changing their activities, or a combination of the two.

The accounting literature provides empirical evidence that higher financial reporting quality enhances investment efficiency (Biddle et al. 2009, Dou et al. 2019). A stated goal of the R&D presentation format change is to increase the transparency of R&D reporting and thus overall financial reporting quality. If firms' higher reported R&D expense in the income statement presentation regime are completely driven by their increased R&D investments in response to enhanced R&D reporting transparency, we would expect that firms' R&D innovation efficiency is largely maintained pre- and post-regulation. However, if the increase in reported R&D expense is at least partly due to managers' opportunistic (over)reporting behavior, or if firms increase their real R&D investment due to heightened investor awareness of their R&D activities by undertaking efficient R&D investment, we should expect a decline in R&D innovation efficiency in the post-regulation period. We state this hypothesis, in alternative form, as follows:

H2: The association between innovation output and reported R&D expense becomes weaker in the income statement presentation regime.

Finally, we examine the capital market valuation of the reported R&D expense. The change in the presentation format of R&D expense highlights the importance of R&D investment for firm valuation and makes R&D information more accessible to investors. This

seems to suggest that investors value reported R&D expense more after the format change. However, rational investors might also take into consideration managers' R&D expense reporting behavior in pricing this information. If managers opportunistically (mis)classify some non-R&D related general and administrative expenses as R&D expense, investors would try to undo this bias by discounting the reported R&D expense. This leads to our last hypothesis (stated in alternative form):

H3: The association between firm value and reported R&D expense becomes weaker in the income statement presentation regime.

3. **Data and Research Design**

Sample and Data

Our sample period spans from 2015 to 2020: the pre-regulation period of 2015–2017 and the post-regulation period of 2018–2020. The symmetric sample period is suitable for us to observe how firms change their R&D reporting and investing behaviors. This relatively short period also has the advantage of avoiding the potential confounds of other regulatory and macroeconomic changes. We obtain firm R&D expenditure data from the Wind database, and financial information and other data from the China Stock Market & Accounting Research Database (CSMAR).

We exclude financial firms from our analysis and require sample firms to have non-missing key variables. We exclude firms with zero-R&D expense which are likely not be affected by the change of R&D expense presentation format, as including these firms may

lower the power of detecting the effect of the regulation.[8] Our final sample consists of 15,618 firm-year observations over the entire sample period.

Hypothesis 1

Our first hypothesis (H1) pertains to whether firms report higher R&D expense after the item is presented on the income statements. We formally test this by estimating the following regression model:

$$\begin{aligned} RDexp_t = \ & \alpha + \beta_1 After + \beta_2 SOE_t + \beta_3 Size_{t-1} + \beta_4 RDcap_t + \beta_5 ROA_t + \beta_6 LEV_t \\ & + \beta_7 FC_t + \beta_8 Growth_t + \beta_9 Analyst_t + \beta_{10} Big4_t + \beta_{11} Taxrate_t \\ & + \beta_{12} HHI_t + Year + Industy + \varepsilon. \end{aligned} \quad (1)$$

The dependent variable, *RDexp*, is a firm's reported R&D expense divided by its total assets. *After* equals to one for the income statement presentation regime of 2018-2020, and zero for the pre-regulation period of 2015-2017. If we find that β_1 is significantly greater than zero, that would indicate support for H1.

The control variables are as follows. Fang et al. (2017) provide evidence that SOEs and non-SOEs have different innovation activities. Therefore, we use the variable *SOE* to distinguish them. Following Bushee (1998), Barker and Mueller (2002) and He and Tian (2013), we control for *Size* (logarithm of total assets), *ROA* (net income divided by total assets), *LEV* (total debt divided by total assets), *FC* (the sum of fixed assets and construction in progress divided by total assets), *Growth* (difference between current and previous years' revenues divided by previous year's revenue) and *HHI* (Herfindahl-Hirschman Index). Since we focus on whether the regulatory change leads to managerial discretionary reporting behaviors, we also control for *Analyst* (logarithm of one plus the number of analysts following the firm), and

[8] In additional tests, we examine whether the regulatory change affects firms' tendency to report non-zero R&D expense by adding back the zero-R&D firms to our sample.

Big4 (whether the firm is audited by a Big-Four accounting firm). Chen et al. (2021) document that Chinese firms may exaggerate R&D spending to reduce tax. Thus, we include *Taxrate* (defined as income tax divided by earnings before tax) as a control. We also control for *RDcap*, which is defined as the capitalized R&D expenditure divided by total assets, since firms can capitalize part of R&D expenditure according to Chinese Accounting Standards. Finally, we include year and industry fixed effects. Variable definitions are contained in the Appendix.

We recognize that the independent variable, *After*, may simply capture the natural growth of firms' R&D activities. To mitigate this concern, we model the expected R&D expense to estimate abnormal R&D expense. Following Gunny (2010) and Fedyk et al. (2017), we use the following model to estimate the expected R&D expense:

$$\frac{RDexp_{i,t}}{TA_{i,t}} = \alpha + \beta_1 \frac{1}{TA_{i,t}} + \beta_2 \frac{RDexp_{i,t-1}}{TA_{i,t}} + \beta_3 Cashratio_{i,t} + \beta_4 Tobinq_{i,t} + \varepsilon. \qquad (2)$$

The dependent variable in model (2) is the current year's R&D expense scaled by total assets. Previous year's R&D expense are included as an independent variable to capture the persistence of R&D investment. *Cashratio*, which is average cash on hand in current year scaled by total assets, captures internal resources that can be invested in R&D activities. *Tobinq*, or Tobin's Q, the sum of market value of equity and book value of liabilities divided by total assets at the end of the year, is included to control for growth. We run model (2) for each industry and use the coefficients from this regression to estimate expected R&D.[9] Then we

[9] We note a caveat in implementing this estimation model in our setting. The State Taxation Administration of China implemented a policy in 2015 to encourage technical innovation, or the "Three-New" policy (i.e., new product, new process, and new technology), which significantly lowered the threshold and simplified the accounting procedure for firms to classify expenses into R&D expense to take advantage of the preferential tax benefits of R&D expense. However, the definitions of the "three-new" and the process to certify the "three-new" were not clearly stipulated at that time. Firms might have taken advantage of the vagueness of this policy to report higher R&D expense in 2015. The central and local governments have since refined and clarified the definitions and the certification process of the "three-new", which gradually limited the scope of R&D expense in 2016 and after. Additionally, the new presentation format change in 2018 might introduce a structural change in R&D

subtract expected R&D from reported R&D to obtain abnormal R&D expense, *ABRDexp*, for each observation. We then re-estimate model (1) with *ABRDexp* as the dependent variable.

In addition, we examine cross-sectional variations of the effect of the presentation format change on firms' reported R&D expense along two dimensions: ownership structure (H1a) and industry peer pressure (H1b). We augment model (1) by including the interaction term of *After* and *SOE* or *RDind* (i.e., the average ratio of R&D expense to total assets in the industry) and re-run the regressions.

Hypothesis 2

To test R&D innovation efficiency (H2), we follow Mukherjee et al. (2017) and use the number of patent applications as the measure of innovation. For the same level of R&D expense, a larger number of patents implies higher innovation efficiency. We test whether firms' innovation efficiency changes from pre- to post-regulation periods by estimating the following equation:

$$\begin{aligned} InventionPatent/DesignPatent/UtilityModels \\ = \alpha + \beta_1 After + \beta_2 RDexp_t + \beta_3 After \times RDexp_t + \beta_4 SOE_t \\ + \beta_5 Size_{t-1} + \beta_6 RDcap_t + \beta_7 ROA_t + \beta_8 LEV_t + \beta_9 FC_t \\ + \beta_{10} Growth_t + \beta_{11} Analyst_t + \beta_{12} Big4_t + \beta_{13} Taxrate_t \\ + \beta_{14} HHI_t + Year + Industy + \varepsilon. \end{aligned} \quad (3)$$

The dependent variable is the logarithm of one plus number of invention patents/design patents/utility models.[11] In the above regression, we are primarily interested in the coefficient β_3 which measures the incremental innovation efficiency after the new regulation. A

expense reporting. Thus the in-sample rolling window estimation of expected R&D could be distorted by the introduction of these evolving policies. Therefore, we use the data in 2014 and 2013 to estimate the expected R&D model (i.e., out-of-sample estimation).

[11] In China, there are three types of patents: invention patents, design patents, and utility model patents. Invention patents protect innovative technologies, products and processes; design patents are applied redesigns of product configuration; and utility model patents cover new technologies to reform the structure of products. Usually, invention patents are most valuable to firms.

significantly positive/negative coefficient would indicate an increase/reduction in the innovation efficiency post-regulation.

Hypothesis 3

To test investor valuation of reported R&D expense (H3), we use Tobin's Q, *Tobinq*, as the proxy of market value (Belderbos et al. 2021) and estimate the following model:

$$\begin{aligned} Tobinq_t = \alpha + \beta_1 After + \beta_2 RDexp_t + \beta_3 After \times RDexp_t + \beta_4 SOE_t + \beta_5 Size_{t-1} + \beta_6 RDcap_t \\ + \beta_7 ROA_t + \beta_8 LEV_t + \beta_9 FC_t + \beta_{10} Growth_t + \beta_{11} Analyst_t + \beta_{12} Big4_t \\ + \beta_{13} Taxrate_t + \beta_{14} HHI_t + Year + Industy + \varepsilon \end{aligned}$$

In the above regression, we are primarily interested in the coefficient β_3 which measures the incremental valuation relevance of R&D expense after the new regulation. If markets see through any potential misclassification of other general and administrative expenses as R&D, we expect the coefficient β_3 to be significantly negative.

4. **Empirical Results**

Table 1 Panel A shows the descriptive statistics of our sample. The mean of *After* is 0.576, i.e. 57.6% of the observations are from the post-regulation period of 2018-2020. On average, R&D expense, *RDexp*, is 2.1% of total assets; at the same time, capitalized R&D expenditure, *RDcap*, is 0.2% of total assets (or approximately 10% of the R&D expense). Around 30% of observations are SOEs. Average leverage ratio is 41.4%, mean ROA is 3.1% and mean tax rate is 14.4%. On average, fixed assets and construction in process, *FC*, accounts for 23.9% of total assets. The mean revenue growth rate is 17.3%. The average total assets is RMB 4,078 million (i.e., *size*, which is the logarithm of total assets, has a mean of 22.129), and the mean analyst following is about 3. On average, 5.2% of observations are audited by the big

four accounting firms. The mean *HHI* is 0.045. Panel B shows that these variables are generally correlated with one another at less than the 10% level.

Figure 1 Panel A graphically presents the mean *RDexp* and *RDcap* for the period 2015-2020. *RDexp* increases from 2015-2017 to 2018-2020. In contrast, *RDcap* remains relatively stable throughout the period, consistent with increased reported R&D expense without increased R&D investment. Panel B presents the mean and median *ABRDexp.* As noted before, *ABRDexp* in 2015 is relatively high because of the tax incentive for and vague implementations of the "Three-New" policy. *ABRDexp* is lower in 2016-2017 than in 2018-2020.

Insert Fig. 1

Table 2 Panel A shows that mean (median) *RDexp* increases from 1.86% (1.58%) in 2015-2017 to 2.24% (1.90%) in 2018-2020, or by 20.3% (20.3%); while mean (median) *Pure SG&A,* which is the difference between reported total SG&A expenses and the R&D expense, increases from 3.20% (2.91%) in 2015-2017 to 3.47 % (3.16%) in 2018-2020, or by 8.22% (8.72%). The increase of *RDexp* before and after the presentation format change exceeds that of *Pure SG&A*, indicating potential overreporting of or increased investment in R&D.

In Table 2 Panel B, for non-SOE subsample, the mean (median) *RDexp* increases from 2.01% (1.75%) in 2015-2017 to 2.49% (2.14%) in 2018-2020, or by 23.71% (22.48%). Mean (median) *Pure SG&A* increases from 3.23% (2.90%) in 2015-2017 to 3.58% (3.26%) in 2018-2020, or by 10.95% (12.28%). For SOE subsample, the mean *RDexp* slightly increases from 1.52% in 2015-2017 to 1.62% in 2018-2020, or by 6.13%, while median *RDexp* decreases by 2.60%. Mean *Pure SG&A* increases slightly from 3.16% in 2015-2017 to 3.20% in 2018-2020, or by 1.05%, while the median SG&A deceases by 0.35%. Panel C contrasts the results for

firms with and without high-tech certification (*Hightech*). In China, when a listed company obtains high-tech enterprise certification, or the certification is extended subsequently, the company usually issues an announcement on that, which attracts higher attention to its R&D status from the capital market. Table 2 Panel C shows the increase in *RDexp* relative to *Pure SG&A* is concentrated on firms with high-tech certification.

Insert Table 2

In summary, Figure 1 and Table 2 together provide preliminary evidence that reported R&D expense increases from 2015-2017 to 2018-2020, and that the increase in reported R&D expense is more likely due to R&D overreporting than increased investment in R&D.

Test of H1

Table 3 Panel A, column (1) presents the results from the estimation of equation (1), which tests whether firms report higher R&D expense after the item is presented on the income statements. The coefficient on *After* is significantly positive (0.00681, t-statistic 19.57), indicating that firms' reported R&D expense as a percentage of total assets increases by 0.681% post-regulation. This is about a 35% increase, as average reported R&D expense in the old regulatory regime is less than 2% of total assets. In terms of economic significance, on average, firms' reported R&D expense increase by close to 28 million from pre- to post-regulation periods, based on the mean total assets of 4,078 million. The result provides support to H1.

Regarding the control variables, the coefficient on *Analyst* is significantly positive, suggesting that firms with more analyst following have more incentives to increase their R&D investment or inflate their R&D expense. The coefficient of *Big4* is significantly positive. One

possibility is that firms with higher R&D activities are more likely to choose to be audited by the big four accounting firms. The coefficient on the *Taxrate* is significantly negative, consistent with the fact that R&D expenditures are given additional tax credits under China's innovation-promoting policies. The significantly negative coefficient on *HHI* may indicate that firms in more competitive industries invest more in R&D activities, or have stronger incentives to inflate R&D expense, or both.

Insert Table 3

Next, we use *ABRDexp* as the dependent variable to re-estimate model (1). The results are presented in column (2) of Table 3 Panel A. The coefficient on *After* is significantly positive (0.00274, t-statistic 12.62), providing further support that firms' abnormal R&D expense increase in the post-regulation period.

We next consider whether firm ownership affects firms' responses to the income statement presentation of R&D expense (H1a). The regression results are reported in Table 3 Panel B. Our variable of interest is the interaction term of *After* and *SOE*. The coefficient on this term is negative (-0.00416 and -0.00137 for *RDexp* and *ABRDexp*, respectively) and significant at 1% level, suggesting that SOEs do not increase reported R&D expense as much as non-SOEs, supporting H1a. Although R&D expense becomes more salient after it is presented in the income statement, and may attract higher investor attention, SOEs apparently do not face the same pressure as non-state-owned counterparties to report higher R&D expense.

We next test whether firms facing higher peer pressure have stronger incentives to increase their reported R&D expense in response to the presentation format change (H1b). We use the industry average R&D expense, *RDind*, to proxy for peer pressure. We are interested in

the coefficient on the interaction term of *After* and *RDind*. Column (2) of Table 4 presents the regression results. The significantly positive coefficient on the interaction term (0.111, t-statistic 4.06) indicates that, in the post-regulation period, firms whose industry peers report higher R&D expense increase their reported R&D expense to a larger extent, supporting H1b.

We re-estimate the peer effect regression for SOEs and non-SOEs separately. Column (3) and (4) of Table 4 present these regression results, respectively. In column (3), the coefficient on the interaction term of *After* and *RDind* is 0.146, and is significant at 1% level, while the coefficient on the interaction term is negative and insignificant in column (4). Thus, peer pressure does not seem to play a role for SOEs, and the documented result of peer pressure in column (2) is driven by non-SOEs. As discussed before, this is likely due to the fact that the evaluation system for SOEs do not include stock performance, and SOEs have lower need to raise fund from the capital market.

Finally, we use high-tech certification as a proxy for peer pressure and examine whether firms with and without such certification change their R&D reporting differently pre- and post-the format change. We add a dummy variable *Hightech*, which equals one if a firm in holds High-tech Certification in at least one year during our sample period, and zero otherwise and its interaction with *After* to equation (1). The regression results are reported in Panel B of Table 4. In column (1), we only add *Hightech* into the regression. The coefficient on *Hightech* is 0.00727, significant at 1% level, which shows that firms with high-tech certification report higher R&D expense. In column (2), the significantly positive coefficient on the interaction term of *After* and *Hightech* (0.00285, t-statistic 6.51) indicates that in the post-regulation period firms with high-tech certification increase their reported R&D expense to a larger extent. We

also examine the effects of high-tech certification for SOEs and non-SOEs separately. The results are reported in column (3) and (4). In column (3), for non-SOEs, the coefficient of the interaction term is positive and significant (0.00241, t-statistic 3.90), while in column (4), the coefficient is insignificant (0.00107, t-statistic 1.48). The results indicates that the high-tech certification mainly puts pressure on non-SOEs.

Insert Table 4

Test of H2

Table 5 presents the regression results of innovation efficiency. In columns (1) and (2), we use the natural logarithm of one plus the number of a firm's invention patent applications (*InventionPatent*) to measure the firm's innovation output. Column (2) of Panel A shows that the coefficient on *After* is significantly negative, which captures the downward trend of Chinese patents applications in recent years since the Chinese government begins to put more weight on patent quality than patent quantity. Our main interest is the coefficients on the interaction term of *After* and *RDexp*. In column (2), the coefficient on this interaction term is significantly negative (-6.013, t-statistic -4.43), indicating that the association between R&D expense and number of invention patent applications diminishes in the post-regulation period. The decline in innovation efficiency, in light of the stable capitalized R&D expenditures and higher growth in reported R&D expense relative to pure SG&A expenses before and after the format change, is consistent with the conjecture that the post-regulation increases in reported R&D expense are at least partly due to misclassification of other expenses as R&D. In columns (3) to (6), we use the natural logarithm of one plus the number of a firm's design patent/utility model patent applications (*DesignPatent/UtilityModels*) as alternative measures of firms' innovation output.

The results in column (4) and (6) are consistent with those in column (2), providing further support of H2.

Insert Table 5

We further re-estimate the innovation efficiency regression for SOEs and non-SOEs separately and present the regression results in Panel B of Table 5. In the first two columns, the dependent variables are *InventionPatent*. The coefficient on the interaction term of *After* and *RDexp* in column (1) is significantly negative, while it is insignificant in column (2), suggesting that R&D expense presentation format change influences invention patent applications of non-SOEs, but not SOEs. When we use *DesignPatent* as the dependent variable in columns (3) and (4), we obtain consistent results with those in columns (1) and (2), respectively. The dependent variables in columns (5) and (6) are *UtilityModels,* and the coefficient on the interaction term of *After* and *RDexp* are significantly negative for both non-SOE and SOE subsamples. Collectively, these results provide evidence that the effect of R&D expense presentation format change on innovation efficiency is concentrated on non-SOEs.

Test of H3

The results we have so far indicate that firms report higher R&D expense in the post-regulation period, and at least part of the increase in reported R&D expense is due to managers' strategic reporting behavior. We now test whether the capital markets are able to unravel this strategic reporting by providing a lower valuation multiple for R&D (H3).

Column (1) of Table 6 reports the results from estimating equation (4). The coefficient on *RDexp* is 11.87, with a t-statistic of 6.59, suggesting that on average markets value R&D

expense positively. The negative coefficient on *After* captures the downward trend of Chinese market from 2015 to 2020. In Column (2) of Table 6, the coefficient β_3 on the interaction of *After* and *RDexp* is -9.932 with a t-statistic of -4.11, indicating that investors put less weight on reported R&D expense in firm valuation post-regulation. The positive relationship between market value and R&D expense indeed is weaker after R&D expense are presented in the income statement. However, the sum of β_2 (18.67 with a t-statistic of 6.84) and β_3 is still significantly positive, indicating that although investors discount the reported R&D expense, they still value it positively post-regulation. The results lend support to H3.

Insert Table 6

We re-estimate the valuation regression for SOEs and non-SOEs separately and report the estimation results in columns (3) and (4) respectively. For non-SOEs, the coefficient on the interaction term of *After* and *RDexp* is -12.86 with a t-statistic of -4.17 while it is insignificant for SOEs. The results are consistent with investors not discounting the reported R&D expense for SOEs as much as for non-SOEs in the post-regulation period because SOEs have less incentive to inflate R&D expense through mis-classification.

5. Additional analysis

Comparing 2017 R&D Expense in 2017 Footnotes and 2018 Financial Statements

In this section, we provide ***direct*** evidence that part of the increases in reported R&D expense post-regulation is due to managers' opportunistic reporting behavior via classification shifting.[12] The financial data of 2017 provides us an ideal setting to conduct this analysis. In

[12] We have only one year data to conduct this analysis (i.e., 2018). Furthermore, in China, there is some flexibility

the 2017 annual reports, R&D expense for the year were presented in the notes to the financial statements, while in the 2018 annual reports, R&D expense were reported as a separate line item in the income statements. We extract the 2017 R&D expense reported on the 2018 comparative income statements, and the 2017 R&D expense originally presented in the notes to the 2017 financial statements. Theoretically, these two amounts should be identical because they capture the same accounting item for the same accounting period. However, as managers increase the reported R&D expense for year 2018 due to the presentation format change, they may desire to increase the reported R&D expense of year 2017 when they are presented alongside the 2018 amounts in the 2018 comparative income statements. We construct a variable, *RDexpdid*, which is the difference between these two amounts, scaled by total assets. The descriptive statistics show that the mean and median of *RDexpdid* all deviate from zero. We estimate the following equation to test whether the retrospective adjustment of 2017 reported R&D expense is positively associated with peer pressure:

$$\begin{aligned} RDexpdid_t = {} & \alpha + \beta_1 RDind_t + \beta_2 SOE_t + \beta_3 Size_{t-1} + \beta_4 RDcap_t + \beta_5 ROA_t \\ & + \beta_6 LEV_t + \beta_7 FC_t + \beta_8 Growth_t + \beta_9 Analyst_t + \beta_{10} Big4_t \\ & + \beta_{11} Taxrate_t + \beta_{12} HHI_t + Industy + \varepsilon. \end{aligned} \quad (5)$$

Panel A of Table 7 reports the regression results from equation (5). In column (1), the coefficient on *RDind* is significantly positive (0.158, t-statistic 3.84), indicating that firms under higher peer pressure adjust reported R&D expense upward strategically to higher levels. This result provides direct evidence that firms manipulate reported R&D expense to cater to

that firms can adjust their R&D expense of the prior year in the current year's financial statements, regardless whether the expenses are presented in the income statement (post-regulation) or the notes to financial statements (pre-regulation). So even though this analysis provides more direct evidence on firms' strategic reporting behavior, we would caution the interpretation of the results of this analysis.

the capital market. Further examination of data reveals that managers reclassify some general and administrative expenses that were not part of R&D expense to R&D expense.

Next, we test whether SOEs and non-SOEs behave in the same way in adjusting their reported R&D expense. We add the interaction term of *RDexp* and *SOE* in estimating equation (5). We do not find any difference between the two groups.

We then examine whether firms with high-tech certification increase reported R&D expense to a higher level, compared with their counterparties without high-tech certification. We add *Hightech,* and its interaction with *RDind* into equation (5). The results are reported in Panel B of Table 7. In column (2), the coefficient on the interaction term of *RDind* and *Hightech* is 0.0768, significant at 1% level. The results indicate that peer pressure causes firms to report higher R&D expense strategically, and high-tech certification further exacerbates such strategic reporting. In column (3) and (4), we examine whether the effect of *Hightech* is the same for SOEs and non-SOEs. The coefficients of the interaction term of *RDind* and *Hightech* are both positive and significant at 5% level. The results indicate that the stronger incentives to overreport R&D expense for high-tech firms do not vary by ownership structure.

Insert Table 7

Likelihood of Reporting Non-Zero R&D Expense

In previous discussions, we focus on firms that report non-zero R&D expense. In this section, we examine whether firms are more likely to report non-zero R&D expense in the post-regulation period by adding back to the sample the firms that report zero R&D expense. Panel A of Table 8 shows the descriptive statistics of the larger sample. The sample size is 18,695.

On average, R&D expense is 1.7% of total assets, unsurprisingly lower than that reported in Table 1 (i.e., 2.1%).

In the post-regulation period, if firms report zero-R&D expense, their lack of conducting innovative R&D activities is highlighted. To avoid sending such a salient negative signal to investors, firms are expected to be more likely to report non-zero R&D expense. we test this prediction by estimating the following logit model:

$$\begin{aligned} HRDexp_t = \ & \alpha + \beta_1 After + \beta_2 SOE_t + \beta_3 Size_{t-1} + \beta_4 RDcap_t + \beta_5 ROA_t + \beta_6 LEV_t \\ & + \beta_7 FC_t + \beta_8 Growth_t + \beta_9 Analyst_t + \beta_{10} Big4_t + \beta_{11} Taxrate_t \\ & + \beta_{12} HHI_t + Year + Industy + \varepsilon. \end{aligned} \quad (6)$$

The dependent variable, *HRDexp,* is an indicator variable that equals to one if a firm's R&D expense is larger than zero in year t; and zero otherwise. The definitions of all other variables are the same as in equation (1). Table 8 Panel B presents the results from the estimation of equation (6). In column (1), the estimated coefficient on *After* is positive and significant at 1% level, indicating that firms' tendency to report non-zero R&D expense increases after MOF requires firms to present R&D expense as a separate line item in the income statements. The coefficient on *SOE* is significantly negative, suggesting that SOEs are more likely to report zero-R&D expense compared to non-SOEs. The results also indicate that larger and more profitable firms tend to report non-zero R&D expense. In addition, firms with higher analyst following tend to report non-zero R&D expense, and firms audited by the big four accounting firms are more likely to report zero R&D expense. One possible explanation is that the big four auditors alleviate strategic managerial R&D reporting. The significantly negative coefficient on *HHI* may indicate firms in more competitive industry are more likely to report zero R&D expense out of proprietary cost consideration. Next, we add an interaction

term of *After* and *SOE* in equation (6), and the regression results are reported in column (2) of Panel B. We do not find that firms' tendency to report non-zero R&D expense post-regulation are different for SOEs and non-SOEs.

Insert Table 8

Site Visits by Institutional Investor

Finally, we examine whether the site visits by institutional investors are affected by the regulatory change. Since R&D activities are of high uncertainty and represent a form of information asymmetry, larger investment in R&D activities attract more institutional investors to conduct site visits to examine the progress and success rate of R&D activities. However, if the increases in firms' reported R&D expense in the post-regulation period are largely due to managerial strategic reporting rather than increased investment in R&D, institutional investors will not increase their costly site visits correspondingly. Thus, the association between institutional investors' site visits and reported R&D expense should be weaker post-regulation. We test this prediction using equation (7):

$$\begin{aligned} Sitevisit_t = \ & \alpha + \beta_1 After + \beta_2 RDexp_t + \beta_3 After \times RDexp_t + \beta_4 SOE_t \\ & + \beta_5 Size_{t-1} + \beta_6 RDcap_t + \beta_7 ROA_t + \beta_8 LEV_t + \beta_9 FC_t \\ & + \beta_{10} Growth_t + \beta_{11} Analyst_t + \beta_{12} Big4_t + \beta_{13} Taxrate_t \\ & + \beta_{14} HHI_t + Year + Industy + \varepsilon. \end{aligned} \quad (7)$$

We use companies that are listed in the Shenzhen Stock Exchange to estimate model (7), since Shenzhen Stock Exchange mandates listed firms to disclose institutional investor site visit information.[13] Column (2) of Table 9 reports the regression results estimated from equation (7). The coefficient on *RDexp* is significantly positive, indicating that institutional

[13] Firms listed in the Shanghai Stock Exchange are not required to disclose investor site visit information, though some firms choose to do so voluntarily. Such endogenous disclosure choice can convey incremental information beyond the disclosed number of site visits.

investors pay more attention to firms that invest more in R&D activities. The coefficient on the interaction term of *After* and *RDexp* is -3.257 with a t-statistic of -1.74. The result is consistent with our prediction that institutional investors are aware of firms' strategic R&D expense reporting in response to the regulatory change. We re-estimate equation (7) for SOEs and non-SOEs separately. For non-SOEs, the coefficient on the interaction term of *After* and *RDexp* is -4.502 with a t-statistic of -2.06, reported in column (3) of Table 9. For SOEs, the coefficient on the interaction term in column (4) is insignificant. The results lend further support to our prediction that non-SOEs have stronger incentive to engage in opportunistic R&D expense reporting, and institutional investors discount their reported R&D expense more post-regulation.

Insert Table 9

6. Conclusion

In this study, we examine whether the presentation format of R&D expense affects managers' R&D expense reporting and investing behavior. We address the research question by employing the setting of China's mandatory requirement of moving from commingling R&D expense with general and administrative expenses in the income statements supplemented with separate notes identification (footnote presentation) to presenting R&D expense as a separate line item on the income statement (income statement presentation). We find that firms are more likely to report non-zero R&D expense after the regulatory change, and for firms reporting non-zero R&D expense, they report higher R&D expense in the income statement presentation regime. We also find that the effect of the R&D expense presentation

format change on firms' reported R&D expense is concentrated on non-SOEs, and is more pronounced for firms facing higher industry peer pressure. We also find that despite the increase in reported R&D expense post-regulation, the capitalized amounts of R&D expenditures remain largely constant, suggesting that firms' higher reported R&D expense in the income statement presentation regime is at least partly due to managers' opportunistic R&D reporting behavior. Using data on innovation outcomes such as patents and utility models, we find that firms' innovation efficiency decreases post-regulation, further supporting the conjecture that managers play a numbers game in R&D reporting. Consistent with this, we find that investor valuation of firms' reported R&D expense is reduced post-regulation, suggesting that investors are aware of managers' opportunistic R&D reporting adjustment in response to the format change, and discount the reported R&D expense in their valuation of firms.

Our findings suggest that corporate managers, investors and regulators play a dynamic game. The regulator's intent for the presentation format change of R&D expense is to make firm R&D investments more transparent to investors. Investors would value more the reported R&D expense if this information is of higher quality. But this format change provides managers incentive to opportunistically over-report R&D expense, which reduces the information quality of the R&D reports. Investors then rationally discount such reports in their analyses and valuation of firms. Our study highlights an observation that regulation can have unintended consequences if the dynamics of the parties that are affected by the regulation are not fully accounted.

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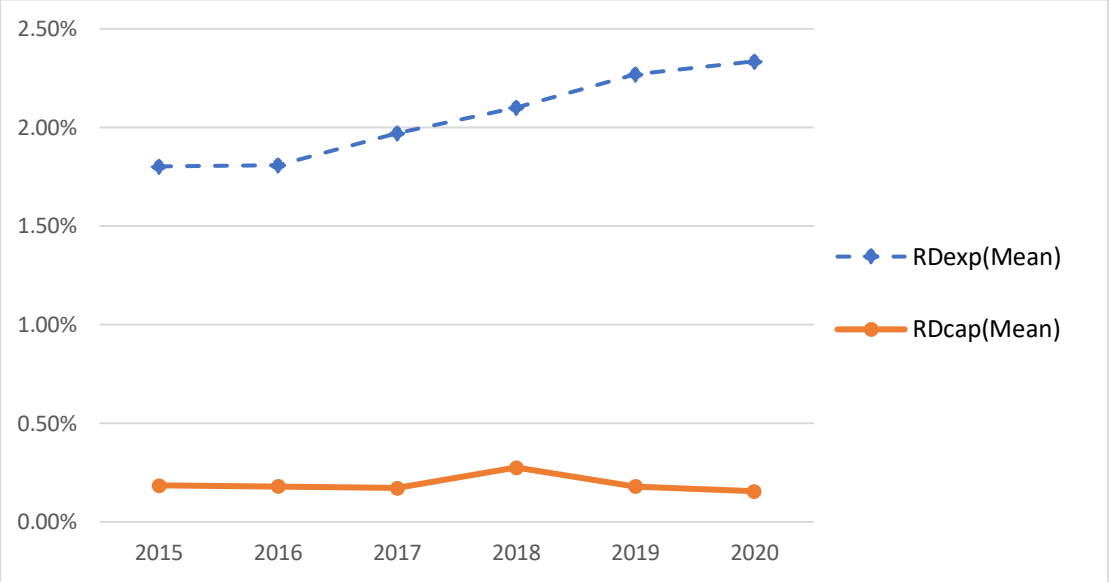
Appendix

This appendix describes the construction of the variables used in this study.

Variable	Definition
HRDexp	An indicator variable, equals to one if a firm's R&D expense are large than 0 in year t; otherwise, equals to zero.
RDexp	R&D expense/Total assets
Hightech	Dummy variable equals one if a firm has High-tech Certification at least one year during our sample period, and zero otherwise.
ABRDexp	Discretionary R&D expense (Fedyk et al., 2017). We regress R&D expense on previous year's R&D expense, cash ratio, and Tobin's Q using the following model by year and industry: $\frac{RDexp_{i,t}}{TA_{i,t}} = \alpha + \beta_1 \frac{1}{TA_{i,t}} + \beta_2 \frac{RDexp_{i,t-1}}{TA_{i,t}} + \beta_3 Cashratio_{i,t} + \beta_4 Tobinq_{i,t} + \varepsilon.$ Using the coefficients from the regressions, we calculate the expected level of R&D expense for a firm. We then subtract the expected level from the actual level to find the abnormal level of R&D expense for a firm.
RDcap	Capitalized R&D expenditure /Total assets
RDexpdid	(The beginning value of R&D expense in 2018 income statement -footnote disclosed R&D expense in 2017 annual report)/ Total assets. This measure is only applicable to 2017 data.
RDind	Average of "R&D expense/ Total assets" of other firms in the industry. We use the industry classification of China Securities Regulatory Commission. Manufacturing industry is defined with second-level industry code, while other industries are defined with first-lever industry code.
Pure SG&A	Total SG&A expenses minus R&D expense.
After	An indicator equal to one for years 2018-2020, and zero otherwise.
SOE	An indicator equal to one which equals to one if the firm is state-owned, zero otherwise.
Size	The natural logarithm of beginning total assets.
ROA	Net income/Total assets
LEV	Liability/Total assets
Am	(Net fixed assets + construction in progress)/Total assets
Growth	(Current year revenue – previous year revenue)/ previous year revenue
Analyst	The natural logarithm of (1+number of analysts that follow a firm)
Big4	An indicator equal to one if auditor of the firm is one of the big four accounting firms, zero otherwise.
Taxrate	Income tax/Earnings before tax
HHI	Herfindahl-Hirschman Index
Cashratio	Cash/Total assets
Tobinq	Tobin's Q = (market value of equity + book value of Liabilities)/ total assets at the end of the year
InventionPatent	The natural logarithm of (1+number of firm's invention patent applications)
DesignPatent	The natural logarithm of (1+number of firm's design patent applications)
UtilityModels	The natural logarithm of (1+number of firm's utility model patent applications)
Sitevisit	The natural logarithm of (1+number of site visits conducted by institutional investors to a firm)

Figure 1 The time-series behavior of *RDexp*, *RDcap* and *ABRDexp*

Panel A: Mean *RDexp* and *RDcap* 2015-2020



Panel B: Mean and Median ABRDexp 2015-2020

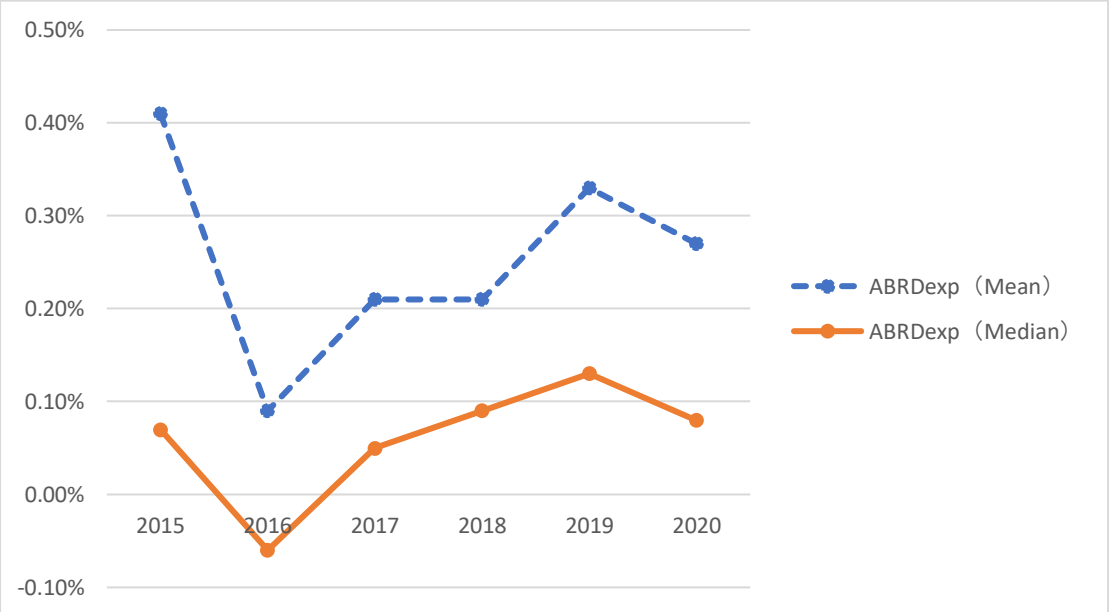


Table 1: Descriptive statistics and correlations

Panel A: Descriptive statistics for the sample (2015-2020)

Variable	Obs	Mean	Std	Min	25%	Median	75%	Max
RDexp	15618	0.021	0.018	0.000	0.008	0.018	0.028	0.107
ABRDexp	15618	0.003	0.010	-0.058	-0.003	0.001	0.006	0.098
RDcap	15618	0.002	0.005	0.000	0.000	0.000	0.001	0.036
RDexpdid	2475	-0.002	0.005	-0.027	0.000	0.000	0.000	0.009
RDind	15618	0.020	0.010	0.000	0.013	0.020	0.026	0.040
After	15618	0.576	0.494	0.000	0.000	1.000	1.000	1.000
SOE	15618	0.299	0.458	0.000	0.000	0.000	1.000	1.000
Size	15618	22.129	1.263	19.288	21.228	21.959	22.840	26.368
ROA	15618	0.031	0.081	-0.713	0.013	0.035	0.064	0.221
LEV	15618	0.414	0.197	0.054	0.258	0.404	0.554	1.031
FC	15618	0.239	0.165	0.001	0.112	0.209	0.334	0.789
Growth	15618	0.173	0.479	-0.733	-0.029	0.102	0.260	6.444
Analyst	15618	1.403	1.195	0.000	0.000	1.386	2.398	3.892
Big4	15618	0.052	0.222	0.000	0.000	0.000	0.000	1.000
Taxrate	15618	0.144	0.171	-0.832	0.088	0.142	0.201	1.025
HHI	15618	0.045	0.048	0.014	0.024	0.032	0.046	0.332
Tobinq	15294	2.694	2.066	0.823	1.407	2.039	3.205	22.734

Table 1 (continued)

Panel B: Pearson correlations for the sample (2015-2020)

	RDexp	ABRDexp	RDcap	RDexpdid	RDind	After	SOE	Size	ROA	LEV	FC	Growth	Analyst	Big4	Taxrate	HHI	Tobinq
RDexp	1																
ABRDexp	0.78***	1															
RDcap	0.13***	0.05***	1														
Rexpdid	-0.11***	-0.13***	0.09***	1													
RDind	0.52***	0.34***	0.21***	0.07***	1												
After	0.10***	0.02***	0.02***	.	0.17***	1											
SOE	-0.18***	-0.12***	-0.01	-0.05**	-0.21***	-0.02***	1										
Size	-0.25***	-0.12***	0.02***	-0.02	-0.24***	0.07***	0.40***	1									
ROA	0.10***	0.06***	-0.03***	-0.03	-0.02**	-0.07***	-0.06***	-0.06***	1								
LEV	-0.20***	-0.05***	-0.01*	-0.06***	-0.19***	0.03***	0.27***	0.49***	-0.34***	1							
FC	-0.19***	-0.07***	-0.01***	-0.09***	-0.21***	-0.03***	0.16***	0.17***	-0.02**	0.11***	1						
Growth	0.02*	0.14***	0.00	0.01	-0.01	-0.12***	-0.07***	-0.10***	0.20***	0.01*	-0.08***	1					
Analyst	0.11***	0.14***	0.10***	0.02	-0.05***	-0.16***	-0.02***	0.35***	0.32***	0.01	-0.02**	0.14***	1				
Big4	-0.03***	-0.01*	-0.00	0.02	-0.07***	0.02**	0.14***	0.33***	0.04***	0.11***	0.05***	-0.01	0.17***	1			
Taxrate	-0.17***	-0.12***	-0.06***	-0.01	-0.18***	-0.05***	0.08***	0.10***	0.15***	0.04***	0.02**	0.04***	0.04***	0.05***	1		
HHI	-0.20***	-0.13***	-0.07***	-0.00	-0.40***	-0.06***	0.15***	0.18***	-0.06***	0.16***	0.02**	0.01	0.06***	0.05***	0.06***	1	
Tobinq	0.27***	0.15***	0.07***	0.06***	0.15***	-0.26***	-0.21***	-0.45***	0.20***	-0.34***	-0.14***	0.11***	0.15***	-0.07***	-0.06***	-0.08***	1

This table presents the sample descriptive statistics (Panel A) and correlations (Panel B). The initial sample includes all A-share firms listed in the Shanghai Stock Exchange (SSE) and the Shenzhen Stock Exchange (SZSE), except firms in financial industry. We exclude firm-year observations that miss key variables, and further exclude 3,077 observations with zero-R&D expense. Our final sample consists of 15,618 observations. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 2: Mean and Median of Firms' R&D expense and *Pure SG&A*

Panel A: Mean and Medians for entire sample

Year	*RDexp*		*Pure SG&A*	
	Mean	Median	Mean	Median
2015	1.80%	1.49%	3.34%	3.06%
2016	1.81%	1.56%	3.15%	2.84%
2017	1.97%	1.68%	3.12%	2.82%
2018	2.10%	1.75%	3.54%	3.20%
2019	2.27%	1.94%	3.53%	3.22%
2020	2.34%	2.00%	3.33%	3.06%

Panel B: Mean and Median for non-SOEs and SOEs

Year	*RDexp*				*Pure SG&A*			
	SOE=0		*SOE*=1		*SOE*=0		*SOE*=1	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
2015	1.95%	1.67%	1.51%	1.11%	3.36%	3.04%	3.32%	3.12%
2016	1.95%	1.72%	1.49%	1.12%	3.16%	2.83%	3.14%	2.87%
2017	2.13%	1.86%	1.57%	1.23%	3.16%	2.84%	3.03%	2.67%
2018	2.33%	2.00%	1.49%	0.98%	3.62%	3.27%	3.34%	3.01%
2019	2.55%	2.20%	1.60%	1.07%	3.67%	3.34%	3.19%	2.86%
2020	2.58%	2.23%	1.76%	1.32%	3.45%	3.17%	3.06%	2.76%

Panel C: Mean and Median for firms with and without High-tech Certification

Year	*RDexp*				*Pure SG&A*			
	Hightech=0		*Hightech* =1		*Hightech* =0		*Hightech* =1	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
2015	1.12%	0.70%	2.21%	2.21%	3.38%	3.10%	3.32%	3.04%
2016	1.11%	0.71%	2.22%	1.93%	3.16%	2.86%	3.14%	2.83%
2017	1.17%	0.78%	2.39%	2.07%	3.12%	2.74%	3.12%	2.83%
2018	1.19%	0.63%	2.56%	2.20%	3.52%	3.13%	3.55%	3.22%
2019	1.22%	0.62%	2.80%	2.39%	3.37%	3.06%	3.61%	3.29%
2020	1.34%	0.77%	2.85%	2.44%	3.24%	2.92%	3.38%	3.11%

Table 3: R&D expense income statement presentation and R&D expense reporting

The table summarizes the estimation of the following equation:

$$RDexp_t = \alpha + \beta_1 After + \beta_2 SOE_t + \beta_3 Size_{t-1} + \beta_4 RDcap_t + \beta_5 ROA_t + \beta_6 LEV_t + \beta_7 FC_t + \beta_8 Growth_t + \beta_9 Analyst_t + \beta_{10} Big4_t + \beta_{11} Taxrate_t + \beta_{12} HHI_t + Year + Industy + \varepsilon.$$

Panel A presents the main results. Dependent variable in equation (1) is RDexp in column (1), and ABRDexp in column (2). Panel B reports the estimation of equation (1), with an interaction term of After and SOE added in equation (1). All variables are defined in the Appendix. Standard errors are clustered at firm level.t statistics are in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Primary results

	RDexp $_t$	*ABRDexp* $_t$
	(1)	(2)
After $_t$	0.00681***	0.00274***
	(19.57)	(12.62)
SOE $_t$	0.000138	-0.000334
	(0.24)	(-1.20)
Size $_{t-1}$	-0.00351***	-0.00107***
	(-13.80)	(-8.56)
RDcap $_t$	0.0884	-0.0559*
	(1.51)	(-1.75)
ROA_t	0.0110***	0.00168
	(3.88)	(1.10)
LEV $_t$	0.00124	0.00421***
	(0.89)	(6.02)
FC_t	-0.00926***	0.000127
	(-6.33)	(0.18)
$Growth_t$	-0.00134***	0.00233***
	(-4.95)	(9.21)
Analyst $_t$	0.00298***	0.00147***
	(13.96)	(14.22)
Big4 $_t$	0.00372***	0.000674
	(3.30)	(1.35)
Taxrate $_t$	-0.00989***	-0.00434***
	(-10.97)	(-8.36)
HHI $_t$	-0.0296***	-0.0152***
	(-3.20)	(-3.22)
Constant	0.0935***	0.0209***
	(18.09)	(8.17)
Industry	Controlled	Controlled
Year	Controlled	Controlled
Obs.	15,618	15,294
R^2_{ajd}	0.317	0.165

Table 3 (continued)

Panel B: With interaction term of After and SOE added to Equation (1)

	$RDexp_t$	$ABRDexp_t$
	(1)	(2)
$After_t$	0.00812***	0.00317***
	(19.98)	(12.84)
SOE_t	0.00252***	0.000468
	(3.89)	(1.28)
$After_t \times SOE_t$	-0.00416***	-0.00137***
	(-8.74)	(-4.43)
$Size_{t-1}$	-0.00350***	-0.00107***
	(-13.78)	(-8.54)
$RDcap_t$	0.0879	-0.0559*
	(1.50)	(-1.75)
ROA_t	0.0112***	0.00173
	(3.94)	(1.13)
LEV_t	0.000965	0.00412***
	(0.69)	(5.89)
FC_t	-0.00945***	0.0000662
	(-6.47)	(0.09)
$Growth_t$	-0.00125***	0.00236***
	(-4.63)	(9.29)
$Analyst_t$	0.00300***	0.00148***
	(14.09)	(14.31)
$Big4_t$	0.00369***	0.000662
	(3.28)	(1.32)
$Taxrate_t$	-0.00984***	-0.00432***
	(-10.91)	(-8.33)
HHI_t	-0.0298***	-0.0153***
	(-3.17)	(-3.21)
Constant	0.0926***	0.0206***
	(17.96)	(8.07)
Industry	Controlled	Controlled
Year	Controlled	Controlled
Obs.	15,618	15,294
R^2_{ajd}	0.319	0.166

Table 4: Peer pressure, R&D expense income statement presentation and R&D expense reporting

The table summarizes the estimation of the following equation:

$$RDexp_t = \alpha + \beta_1 After + \beta_2 RDind_t + \beta_3 After \times RDind_t + \beta_4 SOE_t + \beta_5 Size_{t-1} + \beta_6 RDcap_t + \beta_7 ROA_t + \beta_8 LEV_t + \beta_9 FC_t + \beta_{10} Growth_t + \beta_{11} Analyst_t + \beta_{12} Big4_t + \beta_{13} Taxrate_t + \beta_{14} HHI_t + Year + Industy + \varepsilon.$$

The estimation of the equation is reported for - the full sample (Column 1), with an interaction term of *After* and *RDind* (Column 2), for the non-SOE subsample (Column 3) and SOE subsample (Column 4). All variables are defined in the Appendix. Standard errors are clustered at firm level.t statistics are in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: The effect of industry peer pressure

	RDexp $_t$	*RDexp* $_t$	*RDexp* $_t$ *SOE*=0	*RDexp* $_t$ *SOE*=1
	(1)	(2)	(3)	(4)
After $_t$	0.00260***	0.000618	0.0000182	0.00139**
	(6.99)	(1.30)	(0.03)	(2.03)
RDind $_t$	0.844***	0.733***	0.697***	0.825***
	(18.49)	(12.76)	(10.16)	(7.97)
After $_t$ × *RDind* $_t$		0.111***	0.146***	-0.0302
		(4.06)	(3.95)	(-0.71)
SOE $_t$	0.000509	0.000493		
	(0.91)	(0.88)		
Size $_{t-1}$	-0.00350***	-0.00349***	-0.00378***	-0.00304***
	(-14.19)	(-14.18)	(-11.65)	(-7.65)
RDcap $_t$	0.0300	0.0336	0.0398	0.00448
	(0.52)	(0.58)	(0.58)	(0.04)
ROA $_t$	0.0112***	0.0113***	0.0112***	0.00755
	(3.99)	(4.03)	(3.62)	(1.19)
LEV $_t$	0.000325	0.000360	-0.00147	0.00315
	(0.24)	(0.26)	(-0.89)	(1.29)
FC $_t$	-0.00550***	-0.00572***	-0.00488**	-0.00749***
	(-3.78)	(-3.92)	(-2.52)	(-3.39)
Growth $_t$	-0.00144***	-0.00144***	-0.00147***	-0.00102**
	(-5.48)	(-5.46)	(-4.63)	(-2.24)
Analyst $_t$	0.00324***	0.00322***	0.00341***	0.00301***
	(15.61)	(15.56)	(14.03)	(7.48)
Big4 $_t$	0.00360***	0.00361***	0.00577***	0.00131
	(3.33)	(3.33)	(3.20)	(1.01)
Taxrate $_t$	-0.00833***	-0.00830***	-0.00966***	-0.00583***
	(-9.66)	(-9.62)	(-8.54)	(-4.41)
HHI $_t$	-0.00874	-0.00907	-0.0182*	0.0157
	(-0.92)	(-0.95)	(-1.83)	(0.56)
Constant	0.0766***	0.0785***	0.0861***	0.0670***
	(15.05)	(15.21)	(12.70)	(7.88)
Industry	Controlled	Controlled	Controlled	Controlled
Year	Controlled	Controlled	Controlled	Controlled
Obs.	15,618	15,618	10,954	4,664
R^2_{ajd}	0.346	0.347	0.307	0.389

Table 4 (continued)

Panel B: The effect of high-tech certification

	$RDexp_t$ (1)	$RDexp_t$ (2)	$RDexp_t$ SOE=0 (3)	$RDexp_t$ SOE=1 (4)
$After_t$	0.00643***	0.00461***	0.00383***	0.00330***
	(18.87)	(11.40)	(6.51)	(5.89)
$Hightech_t$	0.00727***	0.00568***	0.00598***	0.00654***
	(13.78)	(9.89)	(8.50)	(6.46)
$After_t \times Hightech_t$		0.00285***	0.00241***	0.00107
		(6.51)	(3.90)	(1.48)
SOE_t	0.00113**	0.00115**		
	(2.03)	(2.06)		
$Size_{t-1}$	-0.00293***	-0.00293***	-0.00322***	-0.00251***
	(-11.69)	(-11.67)	(-9.74)	(-6.28)
$RDcap_t$	0.0621	0.0631	0.0819	0.00326
	(1.07)	(1.09)	(1.20)	(0.03)
ROA_t	0.0101***	0.00995***	0.00976***	0.00555
	(3.69)	(3.63)	(3.22)	(0.92)
LEV_t	0.00162	0.00149	-0.000256	0.00432*
	(1.20)	(1.11)	(-0.16)	(1.83)
FC_t	-0.00959***	-0.00960***	-0.00865***	-0.0120***
	(-6.72)	(-6.72)	(-4.54)	(-5.71)
$Growth_t$	-0.00111***	-0.00114***	-0.00111***	-0.000825*
	(-4.23)	(-4.39)	(-3.53)	(-1.83)
$Analyst_t$	0.00274***	0.00276***	0.00295***	0.00255***
	(12.99)	(13.13)	(11.91)	(6.29)
$Big4_t$	0.00421***	0.00421***	0.00624***	0.00208
	(3.75)	(3.75)	(3.27)	(1.57)
$Taxrate_t$	-0.00831***	-0.00821***	-0.00920***	-0.00639***
	(-9.60)	(-9.49)	(-8.07)	(-4.86)
HHI_t	-0.0269***	-0.0263***	-0.0362***	-0.00108
	(-3.21)	(-3.13)	(-4.33)	(-0.04)
Constant	0.0757***	0.0765***	0.0848***	0.0678***
	(14.54)	(14.67)	(12.09)	(8.03)
Industry	Controlled	Controlled	Controlled	Controlled
Year	Controlled	Controlled	Controlled	Controlled
Obs.	15,618	15,618	10,954	4,664
R^2_{ajd}	0.346	0.347	0.305	0.397

Table 5: Innovation and R&D expense income statement presentation

The table summarizes the estimation of the following equation:

$$InventionPatent/DesignPatent/UtilityModels = \alpha + \beta_1 After + \beta_2 RDexp_t + \beta_3 After \times RDexp_t + \beta_4 SOE_t + \beta_5 Size_{t-1} + \beta_6 RDcap_t + \beta_7 ROA_t + \beta_8 LEV_t + \beta_9 FC_t + \beta_{10} Growth_t + \beta_{11} Analyst_t + \beta_{12} Big4_t + \beta_{13} Taxrate_t + \beta_{14} HHI_t + Year + Industy + \varepsilon.$$

Panel A reports the estimation of the equation using full sample. Column (1), (3), and (5) report the estimation of the equation with the dependent variable is InventionPatent, DesignPatent, and UtilityModels, respectively. Column (2), (4) and (6) report the estimation of the equation, with an interaction term of *After* and *RDexp* added in the equation. Columns in Panel B report the estimation of the equation using SOE and non-SOE subsamples. Specifically, column (1), (3) and (5) of panel B report the estimation of the above equation with an interaction term of *After* and *RDexp* added using non-SOE subsample (*SOE*=0), and (2), (4) and (6) using SOE subsample (*SOE*=1). All variables are defined in the Appendix. Standard errors are clustered at firm level.t statistics are in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Entire sample

	InventionPatent		*DesignPatent*		*UtilityModels*	
	(1)	(2)	(3)	(4)	(5)	(6)
After $_t$	-0.391***	-0.272***	-0.179***	-0.121***	-0.951***	-0.800***
	(-12.84)	(-7.05)	(-6.38)	(-3.60)	(-26.17)	(-17.67)
RDexp $_t$	26.12***	30.20***	10.97***	12.96***	16.66***	21.86***
	(20.91)	(17.59)	(9.33)	(8.22)	(10.95)	(10.74)
After $_t$ ×*RDexp* $_t$		-6.013***		-2.931**		-7.666***
		(-4.43)		(-2.56)		(-5.21)
SOE $_t$	0.177***	0.176***	-0.0549	-0.0556	0.0388	0.0369
	(4.05)	(4.02)	(-1.28)	(-1.30)	(0.78)	(0.74)
Size $_{t-1}$	0.589***	0.589***	0.264***	0.265***	0.513***	0.514***
	(28.76)	(28.84)	(12.65)	(12.67)	(22.16)	(22.23)
RDcap $_t$	14.56***	14.54***	9.711***	9.705***	-10.84**	-10.85**
	(3.98)	(3.99)	(2.60)	(2.59)	(-2.54)	(-2.54)
ROA $_t$	0.615***	0.601***	0.495***	0.488***	0.693***	0.675***
	(3.44)	(3.37)	(3.14)	(3.10)	(3.40)	(3.33)
LEV $_t$	0.262**	0.266**	0.127	0.129	0.895***	0.900***
	(2.46)	(2.50)	(1.33)	(1.35)	(7.31)	(7.37)
FC $_t$	-0.469***	-0.472***	-1.138***	-1.139***	-0.284**	-0.287**
	(-3.71)	(-3.74)	(-9.91)	(-9.92)	(-2.03)	(-2.06)
Growth $_t$	0.184***	0.189***	0.0126	0.0146	0.205***	0.211***
	(6.63)	(6.74)	(0.59)	(0.69)	(7.06)	(7.21)
Analyst $_t$	0.121***	0.121***	0.0967***	0.0965***	0.0587***	0.0582***
	(7.74)	(7.72)	(6.15)	(6.14)	(3.26)	(3.24)
Big4 $_t$	-0.0772	-0.0796	0.143	0.142	-0.194*	-0.197*
	(-0.82)	(-0.84)	(1.42)	(1.41)	(-1.83)	(-1.86)
Taxrate $_t$	-0.232***	-0.239***	-0.0117	-0.0149	-0.145**	-0.154**
	(-3.45)	(-3.55)	(-0.20)	(-0.26)	(-1.96)	(-2.08)
HHI $_t$	-0.585	-0.592	9.857***	9.854***	8.326***	8.318***
	(-0.51)	(-0.52)	(7.38)	(7.39)	(4.40)	(4.40)
Constant	-11.33***	-11.42***	-5.390***	-5.431***	-9.868***	-9.976***
	(-26.69)	(-26.91)	(-12.33)	(-12.40)	(-20.45)	(-20.67)
Industry	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Year	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Obs.	15,618	15,618	15,618	15,618	15,618	15,618
R^2_{ajd}	0.393	0.394	0.186	0.186	0.326	0.328

Table 5 (continued)

Panel B: SOE subsample and non-SOE subsample

	InventionPatent		*DesignPatent*		*UtilityModels*	
	SOE=0	*SOE*=1	*SOE*=0	*SOE*=1	*SOE*=0	*SOE*=1
	(1)	(2)	(3)	(4)	(5)	(6)
$After_t$	-0.326***	-0.245***	-0.0313	-0.258***	-0.732***	-0.820***
	(-6.34)	(-3.79)	(-0.67)	(-4.34)	(-11.41)	(-10.88)
$RDexp_t$	27.15***	35.63***	13.04***	12.09***	17.63***	31.17***
	(14.16)	(10.19)	(7.08)	(4.01)	(7.29)	(8.56)
$After_t \times RDexp_t$	-4.664***	-4.180	-3.399**	-0.782	-5.724***	-8.928***
	(-2.91)	(-1.61)	(-2.47)	(-0.37)	(-3.16)	(-3.29)
$Size_{t-1}$	0.515***	0.726***	0.243***	0.327***	0.430***	0.673***
	(21.24)	(19.83)	(9.50)	(8.88)	(14.85)	(17.45)
$RDcap_t$	8.711**	31.85***	7.427*	14.64*	-18.41***	12.01
	(2.15)	(4.66)	(1.92)	(1.68)	(-3.80)	(1.54)
ROA_t	0.722***	-0.215	0.403**	0.749*	0.775***	-0.131
	(3.79)	(-0.48)	(2.43)	(1.69)	(3.56)	(-0.23)
LEV_t	0.422***	-0.152	0.263**	-0.222	1.066***	0.427*
	(3.54)	(-0.71)	(2.38)	(-1.21)	(7.53)	(1.87)
FC_t	-0.0735	-1.055***	-0.839***	-1.656***	0.00403	-0.739***
	(-0.47)	(-5.15)	(-5.83)	(-8.60)	(0.02)	(-3.37)
$Growth_t$	0.113***	0.378***	-0.00547	0.0827*	0.141***	0.388***
	(3.63)	(7.92)	(-0.23)	(1.91)	(4.13)	(8.34)
$Analyst_t$	0.139***	0.0693**	0.109***	0.0522*	0.0932***	-0.0326
	(7.84)	(2.24)	(6.05)	(1.69)	(4.58)	(-0.90)
$Big4_t$	-0.232*	-0.00967	0.316**	-0.0119	-0.375**	-0.115
	(-1.81)	(-0.07)	(2.02)	(-0.09)	(-2.55)	(-0.83)
$Taxrate_t$	-0.222***	-0.279**	0.00738	-0.0409	-0.115	-0.241*
	(-2.73)	(-2.50)	(0.12)	(-0.35)	(-1.30)	(-1.90)
HHI_t	-0.491	-1.696	10.48***	7.369***	8.624***	6.449**
	(-0.37)	(-1.01)	(6.21)	(3.10)	(3.75)	(2.34)
Constant	-9.892***	-14.06***	-5.183***	-6.417***	-8.314***	-13.25***
	(-19.53)	(-18.42)	(-9.57)	(-8.31)	(-13.58)	(-16.63)
Industry	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Year	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Obs.	10,954	4,664	10,954	4,664	10,954	4,664
R^2_{ajd}	0.322	0.512	0.164	0.254	0.267	0.445

Table 6: Firm value and R&D expense income statement presentation

The table summarizes the estimation of the following equation:

$$Tobinq_t = \alpha + \beta_1 After + \beta_2 RDexp_t + \beta_3 SOE_t + \beta_4 Size_{t-1} + \beta_5 RDcap_t + \beta_6 ROA_t + \beta_7 LEV_t + \beta_8 FC_t + \beta_9 Growth_t + \beta_{10} Analyst_t + \beta_{11} Big4_t + \beta_{12} Taxrate_t + \beta_{13} HHI_t + Year + Industy + \varepsilon.$$

Column (1) reports the estimation of the equation with the full sample. Column (2) reports the estimation of the equation, with an interaction term of *After* and *RDexp* added in the equation. Column (3) presents the estimation of the equation using non-SOE subsample (the variable *SOE*=0), and column (4) presents the estimation using SOE subsample (*SOE*=1). All variables are defined in the Appendix. Standard errors are clustered at firm level.t statistics are in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	$Tobinq_t$	$Tobinq_t$	$Tobinq_t$ *SOE*=0	$Tobinq_t$ *SOE*=1
	(1)	(2)	(3)	(4)
After $_t$	-0.451***	-0.255***	-1.426***	-0.205**
	(-9.10)	(-4.15)	(-15.68)	(-2.43)
RDexp $_t$	11.87***	18.67***	25.51***	-2.676
	(6.59)	(6.84)	(7.67)	(-0.79)
After $_t$ × *RDexp* $_t$		-9.932***	-12.86***	-0.00982
		(-4.11)	(-4.17)	(-0.00)
SOE $_t$	0.0592	0.0574		
	(1.27)	(1.23)		
Size $_{t-1}$	-0.782***	-0.781***	-0.896***	-0.617***
	(-25.78)	(-25.69)	(-23.78)	(-12.68)
RDcap $_t$	19.40***	19.39***	20.60***	16.75*
	(3.87)	(3.87)	(3.76)	(1.96)
ROA $_t$	1.400***	1.376***	1.064***	1.886***
	(4.92)	(4.83)	(3.46)	(2.84)
LEV $_t$	-0.760***	-0.754***	-0.841***	-0.361
	(-5.39)	(-5.35)	(-5.00)	(-1.48)
FC_t	-0.317**	-0.322**	-0.219	-0.664***
	(-2.38)	(-2.41)	(-1.25)	(-3.21)
$Growth_t$	0.0424	0.0495	0.0708	-0.100
	(0.84)	(0.99)	(1.14)	(-1.42)
Analyst $_t$	0.411***	0.411***	0.432***	0.347***
	(21.36)	(21.33)	(17.97)	(11.63)
Big4 $_t$	0.500***	0.495***	0.724***	0.160*
	(4.70)	(4.64)	(3.71)	(1.67)
Taxrate $_t$	-0.0711	-0.0813	-0.113	-0.0749
	(-0.81)	(-0.93)	(-0.96)	(-0.81)
HHI $_t$	-0.420	-0.422	-0.934	1.293
	(-0.42)	(-0.42)	(-0.91)	(0.44)
Constant	19.80***	19.66***	23.22***	16.19***
	(30.70)	(30.29)	(28.45)	(15.54)
Industry	Controlled	Controlled	Controlled	Controlled
Year	Controlled	Controlled	Controlled	Controlled
Obs.	15,294	15,294	10,720	4,574
R^2_{ajd}	0.419	0.421	0.420	0.406

Table 7: Adjustment of R&D expense, Peer pressure and R&D expense income statement presentation

The table summarizes the estimation of the following equation:

$$RDexpdid_t = \alpha + \beta_1 RDind_t + \beta_2 SOE_t + \beta_3 Size_{t-1} + \beta_4 RDcap_t + \beta_5 ROA_t + \beta_6 LEV_t + \beta_7 FC_t + \beta_8 Growth_t + \beta_9 Analyst_t + \beta_{10} Big4_t + \beta_{11} Taxrate_t + \beta_{12} HHI_t + Industy + \varepsilon.$$

Column (1) reports the estimation of the above equation with the full sample. Column (2) reports the estimation of the equation, with an interaction term of *After* and *RDind* added in the equation. All variables are defined in the Appendix. Standard errors are clustered at firm level.t statistics are in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Moderating effect of SOE

	$RDexpdid_t$ (1)	$RDexpdid_t$ (2)
$RDind_t$	0.158***	0.160***
	(3.84)	(3.84)
SOE_t	-0.000408	-0.000271
	(-1.39)	(-0.49)
$RDind_t \times SOE_t$		-0.00737
		(-0.31)
$Size_{t-1}$	0.0000545	0.0000539
	(0.47)	(0.46)
$RDcap_t$	0.0629***	0.0632***
	(2.74)	(2.76)
ROA_t	-0.00651***	-0.00649***
	(-2.61)	(-2.60)
LEV_t	-0.00220***	-0.00219***
	(-2.97)	(-2.96)
FC_t	-0.00219***	-0.00219***
	(-2.75)	(-2.75)
$Growth_t$	0.000158	0.000159
	(0.85)	(0.86)
$Analyst_t$	0.000150	0.000150
	(1.43)	(1.43)
$Big4_t$	0.000958**	0.000957**
	(2.13)	(2.13)
$Taxrate_t$	0.000421	0.000421
	(0.60)	(0.60)
HHI_t	0.00477	0.00478
	(0.77)	(0.77)
Constant	-0.00507*	-0.00510**
	(-1.95)	(-1.96)
Industry	Controlled	Controlled
Obs.	2,475	2,475
R^2_{ajd}	0.040	0.039

Table 7 (continued)

B: Moderating effect of Hightech

	RDexpdid $_t$ (1)	*RDexpdid* $_t$ (2)	*RDexpdid* $_t$ *SOE*=0 (3)	*RDexpdid* $_t$ *SOE*=1 (4)
RDind $_t$	0.187***	0.148***	0.113**	0.209***
	(4.35)	(3.49)	(2.19)	(2.74)
Hightech $_t$	-0.000975***	-0.00243***	-0.00168***	-0.00396***
	(-3.55)	(-3.95)	(-2.60)	(-2.80)
RDind $_t$ × *Hightech* $_t$		0.0768***	0.0563**	0.122**
		(2.98)	(1.99)	(2.02)
SOE $_t$	-0.000521*	-0.000533*		
	(-1.76)	(-1.80)		
Size $_{t-1}$	-0.0000299	-0.0000274	-0.0000879	0.0000165
	(-0.26)	(-0.24)	(-0.62)	(0.08)
RDcap $_t$	0.0648***	0.0670***	0.0754***	0.0534
	(2.81)	(2.90)	(3.12)	(0.92)
ROA $_t$	-0.00666***	-0.00682***	-0.00651***	-0.00908
	(-2.64)	(-2.70)	(-2.85)	(-1.23)
LEV $_t$	-0.00232***	-0.00235***	-0.00233***	-0.00216
	(-3.13)	(-3.16)	(-2.81)	(-1.33)
FC $_t$	-0.00200**	-0.00204**	-0.00267***	-0.00113
	(-2.49)	(-2.54)	(-2.64)	(-0.79)
Growth $_t$	0.000139	0.000149	0.0000654	0.000399
	(0.75)	(0.81)	(0.32)	(1.05)
Analyst $_t$	0.000209**	0.000202*	0.000223*	0.000205
	(1.97)	(1.91)	(1.86)	(0.92)
Big4 $_t$	0.000905**	0.000873*	0.000312	0.00121**
	(2.00)	(1.94)	(0.42)	(2.14)
Taxrate $_t$	0.000172	0.000134	0.000652	-0.000640
	(0.25)	(0.19)	(0.76)	(-0.55)
HHI $_t$	0.00528	0.00497	0.00365	0.00644
	(0.86)	(0.81)	(0.53)	(0.46)
Constant	-0.00312	-0.00241	-0.000528	-0.00519
	(-1.22)	(-0.95)	(-0.17)	(-1.14)
Industry	Controlled	Controlled	Controlled	Controlled
Obs.	2,475	2,475	1,762	713
R^2_{ajd}	0.045	0.048	0.037	0.054

Table 8: R&D expense income statement presentation and Firm's tendency to report non-zero R&D

The table summarizes the estimation of the following logit regression model using both non-zero and zero R&D expense observations:

$$HRDexp_t = \alpha + \beta_1 After + \beta_2 SOE_t + \beta_3 Size_{t-1} + \beta_4 RDcap_t + \beta_5 ROA_t + \beta_6 LEV_t + \beta_7 FC_t + \beta_8 Growth_t + \beta_9 Analyst_t + \beta_{10} Big4_t + \beta_{11} Taxrate_t + \beta_{12} HHI_t + Year + Industy + \varepsilon.$$

Panel A is the descriptive statistics. Based on the sample used in main test, this sample add 3,077 zero R&D expense observations. Panel B reports the estimation of the above equation with the sample described in panel A. All variables are defined in the Appendix. Standard errors are clustered at firm level.t statistics are in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Descriptive statistics

Variable	Obs	Mean	Std	Min	25%	Median	75%	Max
HRDexp	18695	0.835	0.371	0.000	1.000	1.000	1.000	1.000
RDexp	18695	0.017	0.018	0.000	0.002	0.014	0.026	0.107
RDcap	18695	0.002	0.005	0.000	0.000	0.000	0.000	0.036
RDexpdid	2997	-0.001	0.005	-0.027	0.000	0.000	0.000	0.009
RDind	18695	0.018	0.011	0.000	0.008	0.019	0.025	0.040
After	18695	0.558	0.497	0.000	0.000	1.000	1.000	1.000
SOE	18695	0.333	0.471	0.000	0.000	0.000	1.000	1.000
Size	18695	22.177	1.302	19.288	21.254	22.024	22.919	26.368
ROA	18695	0.025	0.090	-0.713	0.011	0.032	0.061	0.221
LEV	18695	0.432	0.208	0.054	0.268	0.420	0.580	1.031
FC	18695	0.240	0.179	0.001	0.100	0.205	0.344	0.789
Growth	18695	0.174	0.560	-0.733	-0.044	0.090	0.255	6.444
Analyst	18695	1.332	1.191	0.000	0.000	1.099	2.303	3.892
Big4	18695	0.056	0.231	0.000	0.000	0.000	0.000	1.000
Taxrate	18695	0.151	0.177	-0.832	0.086	0.146	0.222	1.025
HHI	18695	0.048	0.051	0.014	0.025	0.033	0.048	0.332
Tobinq	18251	2.678	2.227	0.823	1.355	1.967	3.133	22.734

Table 8 (continued)

Panel B: Logit regression

	HRDexp	*HRDexp*
$After_t$	0.903***	0.848***
	(12.66)	(9.95)
SOE_t	-0.261**	-0.320***
	(-2.45)	(-2.62)
$After_t \times SOE_t$		0.118
		(1.12)
$Size_{t-1}$	0.314***	0.314***
	(6.22)	(6.22)
ROA_t	3.116***	3.089***
	(8.29)	(8.19)
LEV_t	-1.202***	-1.199***
	(-4.18)	(-4.17)
FC_t	-1.014***	-1.009***
	(-3.20)	(-3.18)
$Growth_t$	0.0322	0.0303
	(0.62)	(0.58)
$Analyst_t$	0.275***	0.275***
	(6.26)	(6.25)
$Big4_t$	-0.453**	-0.453**
	(-2.26)	(-2.25)
$Taxrate_t$	-0.196	-0.198
	(-1.19)	(-1.20)
HHI_t	-5.974***	-5.953***
	(-2.85)	(-2.82)
Constant	-3.502***	-3.484***
	(-3.38)	(-3.36)
Industry	Controlled	Controlled
Year	Controlled	Controlled
Obs.	18,695	18,695
Pseudo R^2	0.342	0.342

Table 9: Site visit and R&D disclosure

The table summarizes the estimation of the following equation using observations listed in theShenZhen Stock Exchange. Column (1) reports the estimation of the above equation. Column (2) reports the estimation of the above equation, with an interaction term of After and RDexp added in the equation. Column (3) presents the estimation of the equation using non-SOE subsample (the variable SOE=0), and column (4) presents the estimation using SOE subsample (SOE=1). All variables are defined in the Appendix. Standard errors are clustered at firm level.t statistics are in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

$$Sitevisit_t = \alpha + \beta_1 After + \beta_2 RDexp_t + \beta_3 After \times RDexp_t + \beta_4 SOE_t + \beta_5 Size_{t-1} + \beta_6 RDcap_t + \beta_7 ROA_t + \beta_8 LEV_t + \beta_9 FC_t + \beta_{10} Growth_t + \beta_{11} Analyst_t + \beta_{12} Big4_t + \beta_{13} Taxrate_t + \beta_{14} HHI_t + Year + Industy + \varepsilon.$$

	Sitevisit	*Sitevisit*	*Sitevisit* *SOE*=0	*Sitevisit* *SOE*=1
	(1)	(2)	(3)	(4)
After $_t$	-0.0896	-0.0186	0.0217	-0.260**
	(-1.53)	(-0.26)	(0.26)	(-1.98)
RDexp $_t$	9.251***	11.44***	12.52***	8.366**
	(6.14)	(5.90)	(5.62)	(2.11)
After $_t$ ×*RDexp* $_t$		-3.257*	-4.502**	0.0522
		(-1.74)	(-2.06)	(0.01)
SOE $_t$	-0.274***	-0.276***		
	(-4.25)	(-4.27)		
Size $_{t-1}$	0.177***	0.177***	0.199***	0.152**
	(6.46)	(6.46)	(6.31)	(2.58)
RDcap $_t$	12.23***	12.21***	10.09**	19.75*
	(2.84)	(2.83)	(2.15)	(1.89)
ROA $_t$	0.994***	0.985***	1.112***	0.0338
	(4.85)	(4.80)	(5.15)	(0.05)
LEV $_t$	-0.164	-0.163	-0.0384	-0.775**
	(-1.23)	(-1.23)	(-0.26)	(-2.54)
FC_t	0.00586	0.00442	0.0197	-0.0584
	(0.03)	(0.03)	(0.10)	(-0.18)
$Growth_t$	0.0899**	0.0927**	0.0794*	0.178**
	(2.45)	(2.52)	(1.94)	(2.30)
Analyst $_t$	0.900***	0.901***	0.907***	0.864***
	(40.86)	(40.87)	(36.84)	(17.48)
Big4 $_t$	-0.0628	-0.0660	-0.00342	-0.138
	(-0.41)	(-0.43)	(-0.02)	(-0.46)
Taxrate $_t$	-0.121	-0.125	-0.112	-0.0675
	(-1.36)	(-1.40)	(-1.09)	(-0.38)
HHI $_t$	1.845	1.837	1.522	3.880
	(1.38)	(1.38)	(1.05)	(1.52)
Constant	-3.237***	-3.279***	-3.814***	-2.545**
	(-5.60)	(-5.67)	(-5.71)	(-2.08)
Industry, Year	Controlled	Controlled	Controlled	Controlled
Obs.	9,987	9,987	7,943	2,044
R^2_{ajd}	0.410	0.410	0.410	0.410